

Section 2-7

Step Functions

Warm-up

Identify the correct number.

1. What is the greatest integer less than or equal to -63.8 ?

-64

2. What is the smallest integer greater than or equal to -63.8 ?

-63

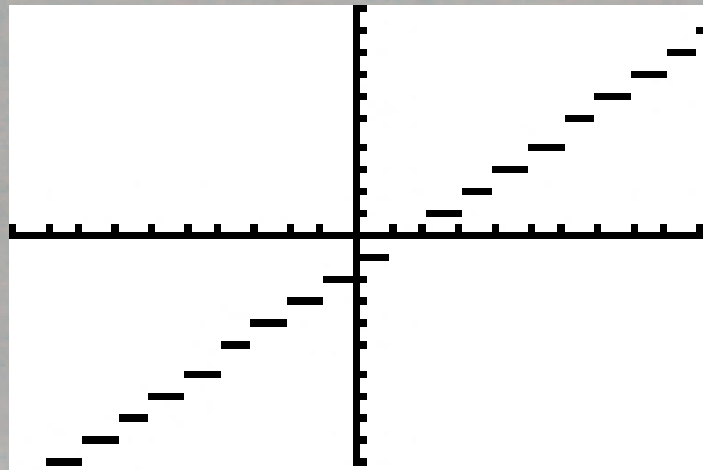
Step Functions: Functions whose graphs look like steps
Often uses the greatest integer function

Greatest Integer Function: The function f such that for every independent variable, the corresponding dependent variable is the greatest integer less than or equal to the independent variable.

This means you take the number and round down!

Example 1

Draw a graph of $f(x) = \lfloor x - 1 \rfloor$



What are some of the characteristics here?

Discontinuous: A graph that has places in a graph where there are holes or jumps

Points of discontinuity: The values of the independent variable where the discontinuities occur

Continuous: A graph without any holes or jumps

Example 2

Evaluate each expression.

a. $\lceil 33.4 \rceil$
34

b. $\lfloor 2\pi \rfloor$
6

c. $\lfloor -\sqrt{7} \rfloor$
-3

d. $\lfloor 100.4 + 98.3 + 6.4 \rfloor$
205

Rounding Up Function:

Just like the Greatest Integer Function, but you round up instead of down.

Example 3

a. Describe all numbers x such that $\lfloor x \rfloor = \lceil x \rceil$.

All integers

a. Describe all numbers x such that $\lfloor x \rfloor > \lceil x \rceil$.

No values

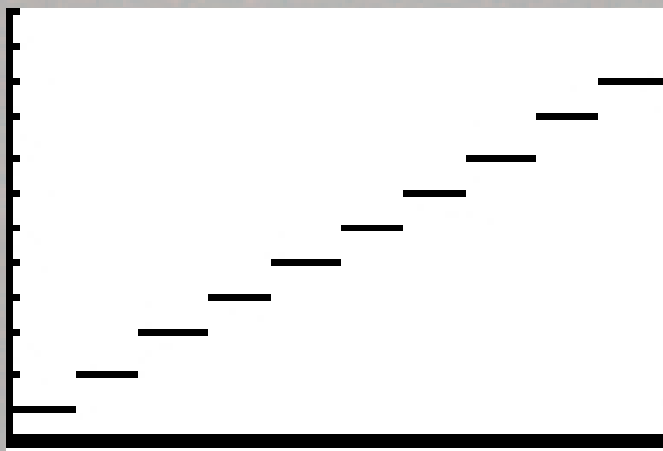
a. Describe all numbers x such that $\lfloor x \rfloor < \lceil x \rceil$.

All non-integers

Example 4

How many buses b are needed to transport s students if each bus can hold 44 students and no other means of transportation is used? Graph the function.

$$b = \left\lceil \frac{s}{44} \right\rceil$$



Example 5

Suppose that it costs \$50 to rent a bus in the situation described in example 4. What will it cost to transport 300 students?

First, how many buses do we need?

$$b = \left\lceil \frac{300}{44} \right\rceil = 7$$

We need 7 buses. That's \$50 per bus, so it will cost \$350

$$b = \$50 \left\lceil \frac{300}{44} \right\rceil$$

Homework

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